VDH COVID-19 Pandemic Metrics Dashboard
Methods - Last Updated 8/12/20

Data sources

Case data are presented by Report Date. This field represents the cumulative number of cases reported by the Virginia Department of Health (VDH) on a daily basis. Daily new cases are calculated as the difference in cumulative cases from the previous day. The decision was made to use report date, as these data are the most real-time measure of activity. This decision is made with the understanding that report date is a data artifact that can be impacted by reporting lag and human behavior changes over weekends and holidays, and system downtime. These data are accessed from a publicly-available output file created during the morning reporting process on a daily basis. This file is built using official case data from the Virginia Electronic Disease Surveillance System (VEDSS).

Data on PCR testing encounters are pulled directly from official testing data in a separate module of VEDSS. These data are available by the lab report date, a field that represents the date the laboratory performing the test finalized the results. This field generally suffers from a one-day lag, but is otherwise near real-time. In order to combat this lag time, lab report date is shifted one day forward and the most recent (unfinalized) day is ignored. Testing encounters are associated with regions of the state using a blended approach using the patient's residential ZIP code where available, else the ordering provider's ZIP code, else the performing laboratory's ZIP code. ZIP codes are assigned to localities and thus to VDH regions using the largest proportion of residents living in that ZIP code. Percent positivity is calculated as the number of positive testing encounters over the total number of completed testing encounters (positive, negative, and inconclusive).

Data on outbreaks are accessed from the Virginia Outbreak Surveillance System (VOSS) where the confirmed etiologic agent is SARS-CoV-2 and the outbreak status is initiated, in progress, or completed. Outbreaks are defined as two or more confirmed cases of COVID-19 connected by person, place, and/or time. These data are available by the date of first report to VDH Central Office, which is a real-time field.

The percent of cases that are among healthcare workers (HCWs) is pulled directly from the VEDSS datamart. As report date is not available for individual cases in this data source, the day after the Notification Submit Date is used as the closest proxy to Report Date. The percent of cases among HCWs is calculated as those cases identified as HCWs over the total number of cases. As this field is not populated for all cases, this percentage is likely an underrepresentation.

Emergency department (ED) visits are accessed from Virginia's syndromic surveillance system, ESSENCE. These data represent visits for a COVID-like illness (CLI), as defined by a fever with a cough and/or shortness of breath. These visits are assigned to VDH regions according to the location of the ED; they include visits from both Virginia and out-of-state residents. These data are available by the date of ED visit, which is a real-time field.

Hospitalization and hospital preparedness data are provided through partnership with the Virginia Healthcare and Hospital Association (VHHA). This organization collects data on a daily basis from facilities in Virginia, including the number of beds currently available in different hospital departments, the number of beds currently occupied by patients with a positive SARS-CoV-2 test, and whether or not they are having difficulty acquiring PPE. As people are generally hospitalized for COVID-19 for longer than a day, the same person may be included in the hospitalization data for several days at a time. These data are presented by the date VDH receives the data from VHHA.

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Analysis

Data are pulled from the above surveillance systems by 9 am every day. All data sources are aggregated at a custom regional geography and state level by day. The custom geography follows VDH health region lines except for the Southwest Region, which is split into Far Southwest and Near Southwest. Far Southwest includes the Lenowisco, Cumberland Plateau, and Mount Rogers health districts, while Near Southwest includes New River, West Piedmont, Central Virginia, Alleghany, and Roanoke City health districts. Those data sources that are available at the locality (city/county) level are also aggregated at that geographic granularity. For sources where the most recent available date is the prior day, data are shifted forward to make analysis across sources possible by day.

A 7-day moving average is calculated for each metric at each geography in order to smooth out the variability in daily reporting and to remove weekday effects.

For metrics that are presented as a percentage with a variable denominator (percent positivity and the percent of cases among HCW), the 7-day moving average is applied after the percentage is calculated. This yields an average of percentages, rather than a percentage of the average.

For metrics that do not have a built-in denominator, a rate is calculated per 100,000 from the 7-day moving average to make comparison across regions possible. While this calculation is helpful for comparing regions, it is not a strictly accurate rate. It may include non-Virginia residents in the numerator (ED visits), the same individual may be included over multiple days (hospitalizations) or the numerator source is not a count of persons (outbreaks).

This 7-day moving average or rate per 100,000 is used to measure the burden of COVID-19 in Virginia.

A spline is calculated from the 7-day moving average and the derivative of the spline is taken to yield the slope. The slope represents the tangent of the trend over time; positive slopes indicate an increase, negative slopes indicate a decrease.

The number of consecutive days with an increase or decrease is tabulated to measure the trend for that individual metric.

These burden and trend statistics are then compared to established thresholds, as laid out in Table 1.

Table 1. Metrics Identified, Thresholds, and Criteria Level

Metric Description	Trend Threshold*	Burden Threshold**	Weight	Geographic Granularity
Number of new cases by report date	14 consecutive days increase or decrease	5/10 cases per 100,000 residents (7-day MA)	6	State, Region, Locality
Test percent positivity by lab report date, PCR only	14 consecutive days increase or decrease	10% +	1	State, Region, Locality
Percent of hospital beds occupied	14 consecutive days increase or decrease	90% hospital beds occupied	1	State, Region
Number of hospitals reporting difficulty acquiring	N/A	1 or more hospitals reporting difficulty	1	State, Region

PPE in next 72 hours		per region within 7-day period		
Percent of new cases reported in healthcare workers	7 consecutive days increase or decrease	5.0% of cases among HCW (7-day MA)	0	State, Region, Locality
Number of current ICU hospitalizations	14 consecutive days increase or decrease	3.5 ICU hospitalizations per 100,000	1	State, Region
COVID-like illness (CLI) emergency department visits	14 consecutive days increase or decrease	4.0/6.0 CLI visits per 100,000 population (7-day MA)	1	State, Region
Number of new confirmed outbreak(s) reported in last 2 weeks	14 consecutive days increase or decrease	0.04/0.06 outbreaks per 100,000 residents (7-day MA)	1	State, Region, Locality
Number of deaths by date of death or date of report	21 consecutive days increase or decrease	0.25/0.50 deaths per 100,000 residents (7-day MA)	0	State, Region

A trend indicator is calculated for each metric according to Table 2 based on the trend statistic and thresholds.

Table 2. Trend Indicator Values

Criteria	Indicator Value
Threshold met in decreasing direction	0
Neither threshold met	1
Threshold met in increasing direction	2

The trend indicator for each metric is weighted by multiplication with the weight listed in Table 1. Weighted indicator values are then summed to create an overall composite score of trend.

An overall burden composite score is calculated in the same manner. Individual indicator values are assigned according to Table 5, assigned weights according to Table 3, and summed to assign an overall burden indicator according to Table 6.

Table 3. Burden Indicator Values

Criteria	Indicator Value
No thresholds met	0
Moderate burden threshold met*	1
High burden threshold met	2

*Some metrics do not have moderate burden thresholds.

The overall burden and trend composite scores are calculated daily. Every Monday, the composite scores from the previous Sunday-Saturday week are averaged to yield a current pandemic status according to the values in Table 4.

Table 4. Overall Current Burden and Trend Status

Sum of Weighted Indicators	Statistic	Current Status
0 - <7	Trend	Decreasing
≥7 - <15	Trend	Fluctuating
≥15 - 22	Trend	Increasing
0 - <8	Burden	Low Burden
≥8 - <16	Burden	Moderate Burden
≥16 - 24	Burden	High Burden

Together, the current pandemic status for burden and trend indicate the extent of transmission according to Table 5.

Table 5. Overall Transmission Extent Status

Burden	Trend	Transmission Extent
Low Burden	Deceasing	At Low Community Transmission
Low Burden	Fluctuating	At Low Community Transmission
Low Burden	Increasing	Approaching Moderate Community Transmission
Moderate Burden	Deceasing	At Moderate Community Transmission
Moderate Burden	Fluctuating	At Moderate Community Transmission
Moderate Burden	Increasing	Approaching Substantial Community Transmission
High Burden	Deceasing	At Substantial Community Transmission
High Burden	Fluctuating	At Substantial Community Transmission
High Burden	Increasing	At Substantial Community Transmission

All analysis is conducted using R version 1.1.453 and RStudio. Data are presented using Tableau 2020.1.